



# Relationship between nutritional status, socio-economic and dental caries status of rehabilitated children of age 4-14 years in Central India

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**ABSTRACT**

**Objective:** To assess the relationship between nutritional status, socio-economic status (SES) and dental caries status of rehabilitated children of age 4-14 years in Central India. **Materials and methods:** The study was conducted at Salod village. The study included a sample size of 150 children of age 4-14 years had who relocated to this village due to the construction of a dam. They were given a structured proforma where the participants were asked to fill in details like their age, gender, height, weight, family income, duration of migration, occupation and education. We used the DMFS/dmfs index for recording the dental caries status and Modified Kuppusswamy scale was used to check the socio-economic status of the children. **Result:** While comparing the dental caries status and nutritional status, a positive relationship was seen. **Conclusion:** From our study, we conclude that the dietetic status was significantly correlated to the dental caries status of rehabilitated children of age 4-14 years in Central India.

**Keywords:** Nutritional status, socio-economic status, dental caries status.

**1. INTRODUCTION**

Nutrition is an essential and important factor in child's growth and development. Children need adequate nutrition that can boost or hinder with normal growth and development. A proper, balanced diet combined with frequent physical activity is a cornerstone of good health as it provides increased immunity, reduced disease vulnerability, increased physical and mental development, and improved productivity. A person's nutritional intake largely affects their body mass index. People having a poor dietary intake will either be overweight or underweight, in terms of BMI. The Body Mass Index (BMI) is an index that measures the height and weight of people who are underweight, overweight and obese. It is recognized as an indicator of food, dental caries and socioeconomic status (Narang R et al., 2012). An ideal BMI is in the range of 12.9 to 22.9. Any deviation from these value results in underweight/overweight condition. The Body Mass Index (BMI) is an index that measures height and weight, categorizing people who are underweight, overweight and obese. In order to calculate BMI, we use the Quetelet index, which is  $BMI = \text{kg} / \text{m}^2$ , where kg is the weight of a child in kilograms and m<sup>2</sup> is its height in metres (Nuttall FQ et al., 2015). It is recognized as an indicator of food, dental caries and socioeconomic status. As far as BMI is concerned, obesity can be defined as a condition in which the BMI of a child is greater than or equal to 97th percentile and excess weight as a condition in which the BMI of a child is greater than or equal to 90th percentile but less than 97th percentile. The United States is found to have the highest rates of obesity with 36.2% of its children in that category. In India alone, 8.82% percent of school children are found to be obese.

Obesity has become the most debilitating burden in the history of modern medicine. It is virulent and is the origin of all risks associated with non-communicable diseases (Acharya S et al., 2013). Obesity appears to influence an individual's general health as well as oral health, and especially in children, it increases the risk of subsequent morbidity, with hypertension, type 2 diabetes mellitus, orthopedic and psychosocial problems, accelerates dental development and reduces masticate on performance (Elangovan A et al., 2018). It is therefore the world's second leading cause of death. Childhood obesity was considered a problem of the affluent countries, but today the problem is starting to appear even in developing countries (Lueangpiansamut J et al., 2012).

In addition to raising awareness among school students about the use of obesity, joint efforts by parents, school and social welfare agencies are needed to address these factors for successful prevention (Sakeenabi B et al., 2012). Malnutrition or under nutrition is referred to as deficiency in a person's intake of nutrients or a problem in absorbing nutrients from food. It is also known to produce adverse effects on oral cavity, and shown to have pre-eruptive and post eruptive effects. It is also associated with enhanced susceptibility to caries because of impaired saliva secretion. Various African nations are known to have highest rates of malnourished children in the world. In India alone, 44% of children have been reported to come under the malnourished category. To solve these issues a child's nutritional behavior must be analyzed and subsequent counseling and treatment of underlying causes should also be done.

Socio Economic Status (SES) is measured as a combination of learning, occupation, monthly wages, social background and type of accommodation (Basakhetre U et al., 2017). SES is known to be the most powerful predictor of future experience of poor oral health and behavior factors may well function as a mediator between social disparities and health outcomes (Mangukia H et al., 2017). A child's economical background influences the probability of seeking dental care (Karnam RR et al., 2016). Several studies have shown that low socioeconomic status, low monthly household income and low level of education are associated with lower access to dental health facilities and oral hygiene programs, poor oral and dental health skills, and higher frequency and severity of dental caries. Hence, the higher the socioeconomic status, the greater the oral health understanding and the less clinically diagnosed dental illness experience.

Dental caries or tooth decay is a multifactorial, infectious, microbiological malady of the tooth and its structures involving demineralization of calcified parts and destruction of organic parts of the tooth. It is caused by definite types of bacteria (cariogenic) that convert the sugar and carbohydrates in the food we eat into acids that lead to the dissolution of the enamel and further lead to decay in the dentin. It remains to be the mainly prevalent constant oral disease in the world, affecting 60% of children worldwide. In India, 53.8% of children show presence of tooth decay. With the growth in the prevalence of consumption of highly refined sugars, the caries rate has increased and has therefore reached epidemic proportions in modern times (Karnam RR et al., 2016). Common risk factors for tooth decay include age, sex, socioeconomic status, race, geographic location, food habits and oral hygiene practices (Shivakumar KM et al., 2009). Prevention of tooth decay can be done by treatment of the underlying cause and raising awareness regarding good oral hygiene practices.

Several studies have shown that increased occurrence of dental caries are found in children that consume food rich in sugars and carbohydrates and also children that come from a low socio economic background but these assessments have numerous variations and are still a topic of debate. Hence, to reach a better understanding of these factors, we conducted this study to assess a correlation between nutritional status, socio-economic status and dental caries status.

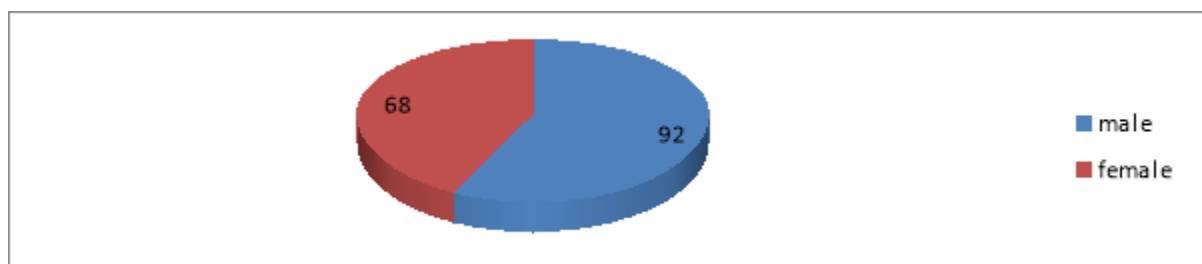
## 2. MATERIAL AND METHODS

The study consists of 150 children of age 4-14 years studying govt. school in rehabilitated village. Before the start of the study Institutional Ethical Committee granted the ethical clearance for the study - Ref.No DMMS (DU)/IEC/Jun-2019/8044. The data was collected using proforma having demographic details & clinical assessments. Demographic Measures includes Information on age, sex, weight and height was recorded by a structured questionnaire. Body Mass Index (BMI) of subjects were calculated using formula  $BMI = \text{kg}/\text{m}^2$  where kg is a person's weight in kilograms and  $\text{m}^2$  is their height in metres squared. The weight of the participants was recorded using a weighing machine ("Zelenor Weight Machine") and height using a measuring tape ("Plastic Children Smile Height Measuring Tape") by investigators (weight in kilograms and height in meters). Socio-economic Status was obtained on the basis of education, occupation and income using modified Kuppaswamy scale. Dental Caries Status was recorded using DMFT/dmft index with the help of a structured questionnaire.

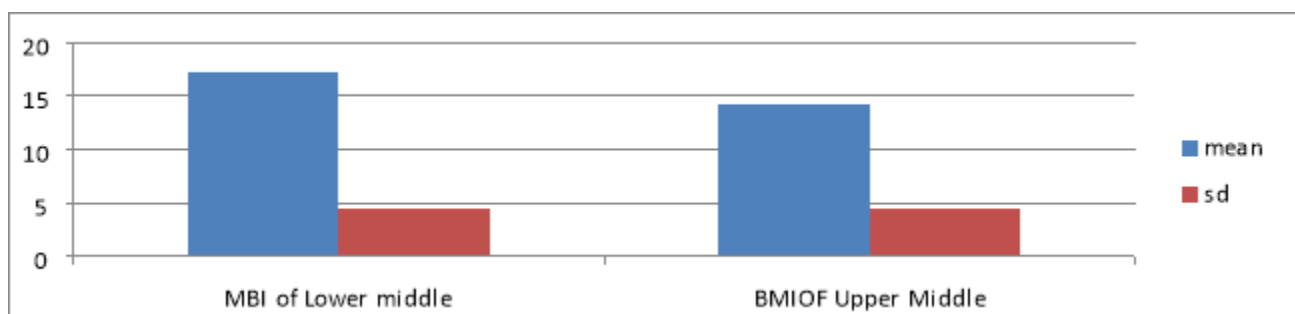
## 3. RESULT

Graph 1 show that out of 150 students 92 of the subjects were Male and 68 were female.

Graph no 2 & table no. 1 shows the difference between the means of two socioeconomic classes against the BMI. The BMI of "lower middle" group ( $17.27 \pm 4.47$ ) is found to be greater than the BMI of "upper lower" group ( $14.21 \pm 2.51$ ). The p-value (0.192) proves that there is no significant relation between BMI of "lower middle" group and BMI of "upper lower" group.



**Graph 1** Distribution of Population according to gender



**Graph 2** differences between BMI on the basis of Socio economic status.

**Table 1** Comparison of BMI on the basis of Socio economic status

| BMI of Lower middle |      | BMI of Upper lower |      | probability-value |
|---------------------|------|--------------------|------|-------------------|
| Mean                | SD   | Mean               | SD   |                   |
| 17.27               | 4.47 | 14.21              | 2.51 | 0.192             |

**Table 2** Comparison of DMFS on basis of BMI using unpaired t test

| DMFS of underweight |      | DMFS of normal |      | probability-value |
|---------------------|------|----------------|------|-------------------|
| Mean                | SD   | Mean           | SD   |                   |
| 15.51               | 2.82 | 0.76           | 0.75 | 0.00              |

Table no.2 shows the difference between the means of two BMI classes against the DMFS. The DMFS of "underweight" group ( $15.51 \pm 2.82$ ) is found to be greater than the DMFS "normal" group ( $0.76 \pm 0.75$ ). The p-value (0.00) proves that there is significant relation between DMFS of "underweight" group and "normal" group.

**Table 3** Comparison of dmfs on the basis of BMI using unpaired t test

| DMFS of Lower Middle |      | DMFS of Upper Lower |      | probability-value |
|----------------------|------|---------------------|------|-------------------|
| Mean                 | SD   | Mean                | SD   |                   |
| 1.45                 | 1.64 | 1.07                | 1.66 | 0.224             |

Table no.3 shows the difference between the means of two BMI classes against the dmfs. The dmfs of "underweight" group ( $15.51 \pm 2.82$ ) is found to be greater than the dmfs "normal" group ( $0.56 \pm 1.40$ ). The p-value (0.00) proves that there is significant relation between dmfs of "underweight" group and "normal" group.

**Table 4** Comparison of DMFS on the basis of Socio economic status using unpaired t test

| dmfs of underweight |      | dmfs of normal |      | probability-value |
|---------------------|------|----------------|------|-------------------|
| Mean                | SD   | Mean           | SD   |                   |
| 15.51               | 2.82 | 0.56           | 1.40 | 0.00              |

Table no. 4 shows the difference between the means of two socioeconomic classes against the DMFS. The DMFS of “lower middle” group ( $1.45 \pm 1.64$ ) is found to be greater than the DMFS of “upper lower” group ( $1.07 \pm 1.66$ ). The p-value (0.224) proves that there is no significant relation between DMFS of “lower middle” group and “upper lower” group.

**Table 5** Comparison of dmfs on the basis of Socio economic status using unpaired t test

| dmfs of Lower Middle |      | dmfs of Upper Lower |      | probability-value |
|----------------------|------|---------------------|------|-------------------|
| Mean                 | SD   | Mean                | SD   |                   |
| 0.51                 | 1.45 | 0.64                | 1.26 | 0.627             |

Table no. 5 shows the difference between the means of two socioeconomic classes against the dmfs. The dmfs of “lower middle” group ( $0.51 \pm 1.45$ ) is found to be greater than the dmfs of “upper lower” group ( $0.64 \pm 1.26$ ). The p-value (0.627) proves that there is no significant relation between dmfs of “lower middle” group and “upper lower” group.

**Table 6** Pearson’s correlation table

|     |                     | SES | BMI   | DMFS   | Dmfs  |
|-----|---------------------|-----|-------|--------|-------|
| SES | Pearson Correlation | 1   | -.107 | -.100  | .040  |
|     | Sig. (2-tailed)     |     | .192  | .224   | .627  |
|     | N                   |     | 150   | 150    | 150   |
| BMI | Parson Correlation  |     | 1     | .296** | -.071 |
|     | Sig. (2-tailed)     |     |       | .000   | .391  |
|     | N                   |     |       | 150    | 150   |

Table no. 6 compares the p values of BMI, DMFS, dmfs and SES. From the above given table we conclude that there is significant correlation between the probability value (0.00) of BMI and DMFS, probability value (0.00) of BMI and dmfs. We also conclude that the probability value (0.192) of BMI and SES is not significantly correlated. There is also no significant relationship between SES p (0.224) and DMFS, SES p(0.627) and dmfs.

#### 4. DISCUSSION

This study was conducted amongst the rehabilitated population, as our aim was to observe the effects of displacement on children of age group 4-14 regarding their dental health, health in general and their family’s socioeconomic status. Obesity and dental caries show similar contributing factors such as dietary intake and its frequency, heredity, socio-economic status, etc. (Patil S et al., 2018). All dental caries and BMI assess diet related health effects with SES as a predilection for both. Our study aims to determine a correlation between nutritional status, the status of dental caries, and SES. Children aged 4-14 years of age were chosen for assessment in our sample and children from this age group had mixed dentition. Children of all ages display dental caries. Therefore, according to our report, there was no significant correlation between age and dental caries. The study carried out by Elangovan A et al., Lueangpiansamut J et al., in 2012 in the district of Na Klang, Thailand, and Mitrakul K et al., in 2016 showed that no considerable difference existed in age-related dental caries experiences. (Elangovan A et al., 2012; Lueangpiansamut J et al., 2012; Patil S et al., 2018) found that 67% of children in our study were underweight and children with low BMI showed higher children with low BMI showed higher n with low BMI showed higher The response was that there is a growing awareness of oral hygiene as age found that 67% of children in our study were underweight and children with low BMI showed higher progresses, the permanent teeth are more resistant to the caries process than the temporary teeth (Sudha P et al., 2005). Natural exfoliation leads to different outcomes and Difference in Geographic location were other factors responsible factor for variable results in each study. One of our study’s aims is to determine the association between dental caries and the health of the baby. We calculated BMI for evaluating nutritional status and DMFT for caries occurrence.

It was found that 67% of children in our study were underweight and children with low BMI showed higher Dmfs found that 67% of children in our study were underweight and children with low BMI showed higher score, found that 67% of children in our study were underweight and children with found that 67% of children in our study were underweight and children with low BMI showed higher A research by Adeniyi et al. indicated that children who are under nourished and anorexic may be more vulnerable to cavities than regular kids. Underweight kids also had a higher caries prevalence with a higher chance of developing caries (1.87) (Cinar B et al., 2008). Thus it was concluded that underweight children were at higher risk because of the low immunity and more prone to infections and overweight children were also at a risk because of consumption of sugary foods and poor in nutrients and normal-weight children comparatively showed healthy oral hygiene. The other objective of our study was evaluating relationship between SES and BMI. For evaluating SES, education and monthly income were taken into consideration. In our study it was observed that there found that 67% of children in our study were underweight and children with low BMI showed higher. On the other side, an opposite correlation among SES and BMI was found in this research conducted by James et al, which was conducted in the USA and Germany (McLaren L et al., 2007). The last objective of our study was to evaluate relationship between SES and DMFS, it was found that there was no significant relationship between the two. Children showed presence of dental caries irrespective of their family income, education and occupation of their parents. Our findings were similar to the study conducted by Saeed et al. that showed negative results, household income and dental caries were taken into consideration (Matthis Morgenstern et al., 2009). In this analysis by Nahid et al. an inverse relationship was observed amongst the two, individuals with low family income showed high level of dental caries and vice versa. This was because of low nutritional status due to low income (Amiresmaili M et al., 2018). In this study conducted by Miranda Davis it was observed that the relationship between SES and DMFS was positive, some individuals experience lower caries prevalence despite poor SES and some experience high caries prevalence despite high SES, this study was conducted in native Americans (Elfaki NK et al., 2015).

### Limitations

The sample size taken for our study was small and data collection isolated to a single geographical area due to participants being rehabilitated children which were less in number and only found in that particular area.

## 5. CONCLUSION

Our analysis shows a substantial positive association between the index of body mass and the status of dental caries. Participants with lower BMI were more likely to have higher dmfs scores and vice-versa. However, the socio economic background of the participants was in no way associated with either the BMI or the dental caries status.

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**Conflicts of Interest:** The authors declare no conflict of interest.

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